

MATH 1210-6
Spring 2003
Midterm exam II

Student Name: _____

Student ID Number: _____

Course Abbreviation and Number:	<i>Math 1210</i>
Course Title:	<i>Calculus I</i>
Instructor:	<i>Vladimir Vinogradov</i>

Date of Exam:	<i>March 7, 2003</i>
Time Period:	<i>Start time: 12:55 pm End Time: 1:55 pm</i>
Duration of Exam:	<i>1 hours</i>
Number of Exam Pages:	<i>8</i>
<i>(including this cover sheet)</i>	
Exam Type:	<i>Closed Book</i>
Additional Materials Allowed:	<i>Calculator</i>

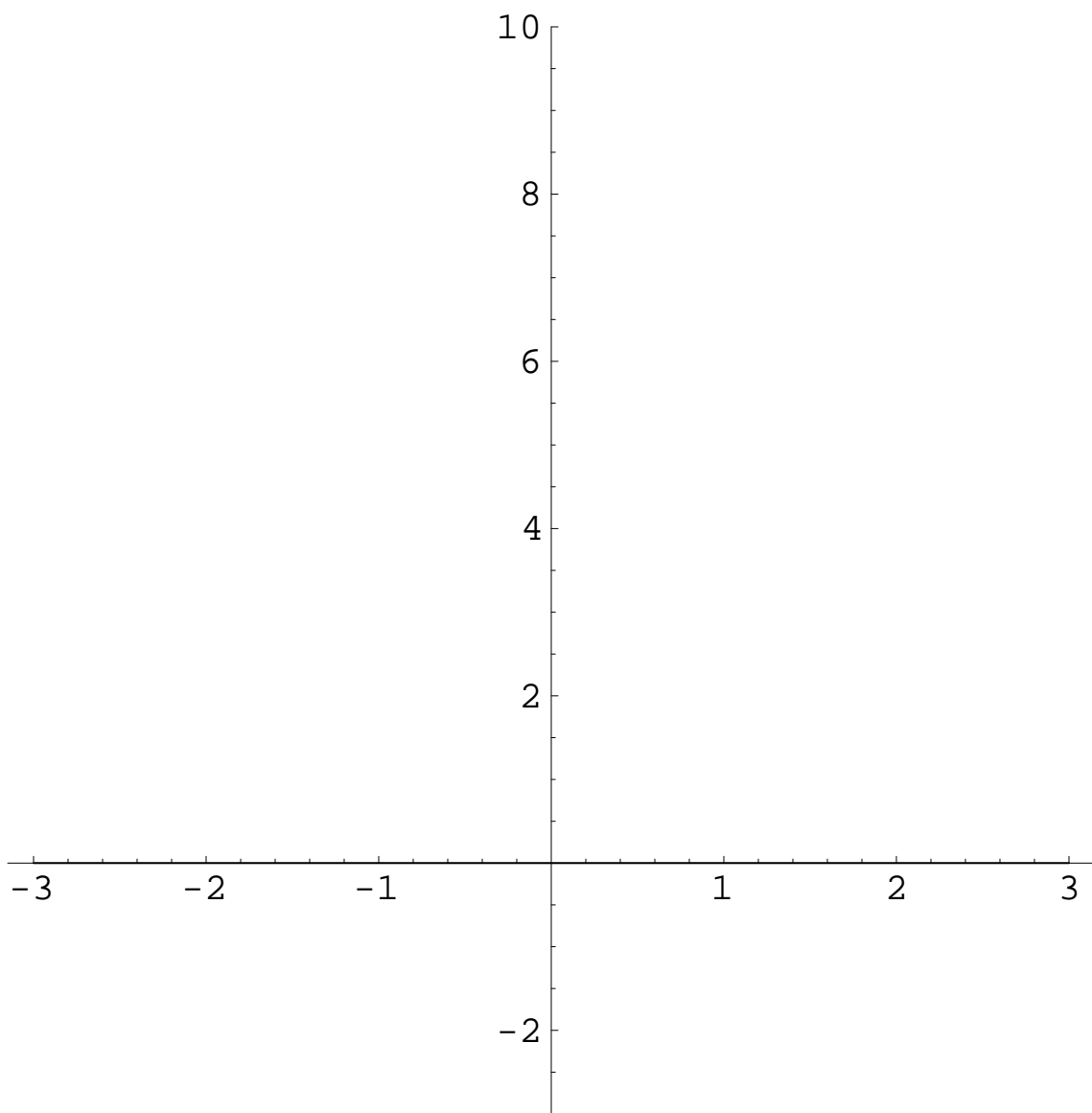
Marking Scheme:

QUESTION	VALUE	SCORE
1	70	
2	30	
TOTAL	100	

*) The bonus question counts for 10 points maximum.

1. (70 points) Derive enough information about the curve and sketch the graph of the following function. Show a) all asymptotes, b) all critical values, c) all points of inflection.

$$y(x) = \frac{x^2 - 4}{x^2 - 1}.$$

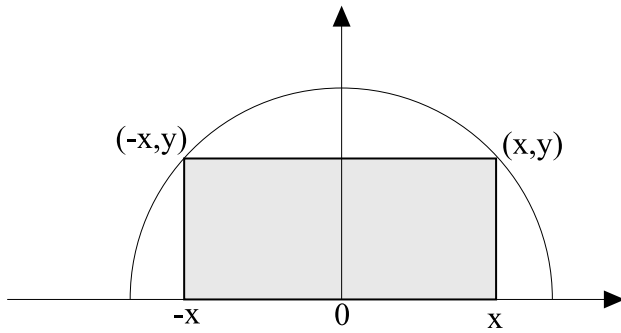


2. (30 points) Find the absolute maximum and minimum of the function

$$y = x^3 - 12x^2$$

on the interval $-2 \leq x \leq 15$

Bonus question (10 points). A rectangle is to be inscribed in a semicircle of radius r ($y = \sqrt{r^2 - x^2}$), as shown in the figure. What are the dimensions of the rectangle if the area is to be maximized?



ANSWER: _____

Useful formulae

Constant multiple rule:

$$(k f(x))' = k f'(x)$$

Sum rule:

$$(f(x) + g(x))' = f'(x) + g'(x)$$

Product rule:

$$(f(x)g(x))' = f'(x)g(x) + f(x)g'(x)$$

Quotient rule:

$$\left(\frac{f(x)}{g(x)}\right)' = \frac{f'(x)g(x) - f(x)g'(x)}{g^2(x)}$$

Chain rule:

$$\begin{aligned}\frac{d}{dx}f(g(x)) &= \frac{df}{dg} \cdot \frac{dg}{dx} \\ \frac{d}{dx}f(g(h(x))) &= \frac{df}{dg} \cdot \frac{dg}{dh} \cdot \frac{dh}{dx} \\ \frac{d}{dx}f(g(h(u(x)))) &= \frac{df}{dg} \cdot \frac{dg}{dh} \cdot \frac{dh}{du} \cdot \frac{du}{dx}\end{aligned}$$

Power rule

$$(x^\alpha)' = \alpha x^{\alpha-1}$$